

1 1. In a video management system configured to receive a video stream
2 containing one or more video pictures that are each divided into blocks, wherein the video
3 management system is to provide a representation of the one or more video pictures to a
4 subsample decoder for subsampling, a method of reducing the size of the one or more
5 frames with minimal, if any, effect on the video quality generated from the one or more
6 frames after subsampling, the method comprising the following:

7 accessing a video picture that is to be subsampled; and

8 for at least one block of the video picture, reducing the size of the block to
9 generate a reduced size block in such a way that subsampled decoding the reduced
10 size block results in substantially the same reduced size image as subsampled
11 decoding the original block.

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13 2. The method in accordance with Claim 1, wherein the method further
14 comprises the following:

15 providing the video picture with its one or more reduced size blocks to the
16 subsample decoder.

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18 3. The method in accordance with Claim 1, wherein the method further
19 comprises the following:

20 subsampled decoding the video picture.

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22 4. The method in accordance with Claim 3, wherein the method further
23 comprises the following:

24 displaying the subsample decoded video picture on a display device.

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2 5. The method in accordance with Claim 3, further comprising the following:

3 displaying the subsample decoded video picture on a display device as a
4 reduced sized picture of a picture-in-picture display.
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6 6. The method in accordance with Claim 1, wherein the act of reducing the size
7 of the block to generate a reduced size block comprising the following:

8 representing the block as a matrix;

9 pre-multiplying the block matrix by a pre-multiplication matrix, the pre-
10 multiplication matrix generated from a first subsample matrix that represents the
11 subsampled decoding in a first direction; and

12 post-multiplying the block matrix by a post-multiplication matrix generated
13 from a second subsample matrix that represents the subsampled decoding in a second
14 direction that is substantially perpendicular to the first direction.
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16 7. The method in accordance with Claim 6, further comprising:

17 receiving an indication over a network that the subsample decoder is to
18 operate on the video stream.
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20 8. The method in accordance with Claim 6, further comprising:

21 receiving the first and second subsample matrix over a network from the
22 subsample decoder.
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24 9. The method in accordance with Claim 6, wherein the first subsample matrix

1 is a vertical subsample matrix that represents the vertical subsampling that is to be
2 performed by the subsample decoder, and wherein the second subsample matrix is a
3 horizontal subsample matrix that represents the horizontal subsampling that is to be
4 performed by the subsample decoder, the method further comprising the following:

5 generating the pre-multiplication matrix by performing the following:

6 determining a first inverse matrix that represents the multiplication
7 inverse of a matrix that results from the multiplication of a first transform
8 matrix times the vertical subsampling matrix; and

9 multiplying the first inverse matrix by the vertical subsampling matrix
10 to generate the pre-multiplication matrix.

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12 10. The method in accordance with Claim 9, wherein determining a first inverse
13 matrix that represents the multiplication inverse of a matrix that results from the
14 multiplication of a first transform matrix times the vertical subsampling matrix comprises
15 the following:

16 determining a first inverse matrix that represents the multiplication inverse of
17 a matrix that results from the multiplication of a vertical discrete cosign transform
18 matrix times the vertical subsampling matrix.

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20 11. The method in accordance with Claim 9, wherein determining a first inverse
21 matrix that represents the multiplication inverse of a matrix that results from the
22 multiplication of a first transform matrix times the first subsampling matrix comprises the
23 following:

24 determining a first inverse matrix that represents the multiplication inverse of

1 a matrix that results from the multiplication of a vertical wavelet transform matrix
2 times the first subsampling matrix.

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4 12. The method in accordance with Claim 9, further comprising the following:
5 generating the post-multiplication matrix by performing the following:

6 determining a second inverse matrix that represents the multiplication
7 inverse of a matrix that results from the multiplication of a second transform
8 matrix times the transpose of the horizontal subsampling matrix; and

9 multiplying the transpose of the horizontal subsampling matrix by the
10 second inverse matrix to generate the post-multiplication matrix.

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12 13. The method in accordance with Claim 12, wherein determining a second
13 inverse matrix that represents the multiplication inverse of a matrix that results from the
14 multiplication of a second transform matrix times the horizontal subsampling matrix
15 comprises the following:

16 determining a second inverse matrix that represents the multiplication inverse
17 of a matrix that results from the multiplication of a horizontal discrete cosign
18 transform matrix times the horizontal subsampling matrix.

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20 14. The method in accordance with Claim 12, wherein determining a second
21 inverse matrix that represents the multiplication inverse of a matrix that results from the
22 multiplication of a second transform matrix times the horizontal subsampling matrix
23 comprises the following:

24 determining a second inverse matrix that represents the multiplication inverse of a

1 matrix that results from the multiplication of a horizontal wavelet transform matrix times the
2 horizontal subsampling matrix.

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4 15. The method in accordance with Claim 12, further comprising the following:
5 horizontal subsampling the video picture using the horizontal subsampling
6 matrix; and
7 vertical subsampling the video picture using the vertical subsampling matrix.
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10 16. The method in accordance with Claim 1, wherein the at least one block of the
11 video picture comprises all the blocks in the video picture.
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13 17. The method in accordance with Claim 1, wherein the act of accessing a video
14 picture that is to be subsampled comprises the following:

15 accessing a video frame that is to be subsampled.
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17 18. The method in accordance with Claim 1, wherein the act of accessing a video
18 picture that is to be subsampled comprises the following:

19 accessing a video frame that is to be subsampled.
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1 19. In a video management system configured to receive a video stream
2 containing one or more video pictures that are each divided into blocks, wherein the video
3 management system is to provide a representation of the one or more video pictures to a
4 subsample decoder for subsampling, a method of reducing the size of the one or more
5 frames with minimal, if any, effect on the video quality generated from the one or more
6 frames after subsampling, the method comprising the following:

7 accessing a video picture that is to be subsampled; and

8 for at least one block of the video picture, performing the following:

9 representing the block as a matrix;

10 pre-multiplying the block matrix by a pre-multiplication matrix, the
11 pre-multiplication matrix generated from a first subsample matrix that
12 represents the subsampled decoding in a first direction; and

13 post-multiplying the block matrix by a post-multiplication matrix
14 generated from a second subsample matrix that represents the subsampled
15 decoding in a second direction that is substantially perpendicular to the first
16 direction.

17 20. The method in accordance with Claim 19, wherein the method further
18 comprises the following:

19 providing the video picture with its one or more reduced size blocks to the
20 subsample decoder.
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22 21. The method in accordance with Claim 19, wherein the method further
23 comprises the following:
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subsampled decoding the video picture.

22. The method in accordance with Claim 19, wherein the method further comprises the following:

displaying the subsample decoded video picture on a display device.

1 23. A video management system configured to receive a video stream containing
2 one or more video pictures that are each divided into blocks, wherein the video management
3 system is to provide a representation of the one or more video pictures to a subsample
4 decoder for subsampling, the video management system comprising the following:

5 means for accessing a video picture; and

6 means for transcoding the video picture such that subsampled decoding the
7 reduced size picture results in substantially the same reduced size image as
8 subsampled decoding the original video picture.
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1 24. A video management system configured to receive a video stream containing
2 one or more video pictures that are each divided into blocks, wherein the video management
3 system is to provide a representation of the one or more video pictures to a subsample
4 decoder for subsampling, the video management system comprising the following:
5 a memory configured to store one or more video pictures; and
6 a transcoder configured to perform the following:
7 accessing a video picture from the memory;
8 for at least one block of the video picture, performing the following:
9 representing the block as a matrix;
10 pre-multiplying the block matrix by a pre-multiplication matrix, the
11 pre-multiplication matrix generated from a first subsample matrix that
12 represents the subsampled decoding in a first direction; and
13 post-multiplying the block matrix by a post-multiplication matrix
14 generated from a second subsample matrix that represents the subsampled
15 decoding in a second direction that is substantially perpendicular to the first
16 direction.
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1 25. A video network comprising the following:
2 a video management system configured to perform the following:
3 accessing a video picture;
4 transcoding the video picture so as to reduce the size of the video
5 picture without introducing error as measure after subsampling; and
6 a video node coupled to the video management system so as to receive the
7 transcoded video picture from the video management system, the video node further
8 configured to subsample the transcoded video picture; and
9 a display device coupled to the video node so as to receive the subsampled
10 video picture, the display device further configured to display the subsampled video
11 picture.